

Bachelor of Engineering (Electrical Engineering), 4th Year 1st Sem. Exam, 2019**SUBJECT : ELECTRIC UTILIZATION AND ILLUMINATION ENGG.**

Time: Three Hours

Full Marks: 100 (50 each part)

Use a separate Answer-Script for each part

| Question No. | PART - I | Marks |
|--------------|---|-------|
| 1. | <p>Answer question no. 1 and any two from the rest Correct and/or justify the following statements (any six)</p> <p>(a) Power factor gets poorer due to distorted line current.</p> <p>(b) An LC tuned filter (for particular harmonics) offers capacitive effect at line frequency.</p> <p>(c) High voltage and low current is good for an arc furnace.</p> <p>(d) If the voltage is non-sinusoidal, the power contributed by the current harmonics is zero.</p> <p>(e) In direct arc furnace, any external means of stirring the charge is not required.</p> <p>(f) Any discharging rate does not necessarily give full Ampere-hour of a battery.</p> <p>(g) dT/dt charge termination method is employed for Li-ion batteries.</p> | 6x3 |
| 2.(a) | <p>Why reactors must be used in an EAF?</p> <p>(b) Compare different types of electrodes used for arc furnace.</p> <p>(c) We got the following data from a 3 phase EAF. (Y-connected electrodes) Current drawn : 5kA Arc voltage : 50V Total resistance including electrode : 0.005Ω Total reactance including electrode : 0.02Ω Calculate the kVA and kW drawn from the supply, its p.f. and electrical efficiency.</p> | 4+4+8 |

[Turn over

Use a separate Answer-Script for each part

| Question No. | PART - I | Marks |
|--------------|--|-------|
| 3.(a) | Highlight different modes of battery charging. | 8+5+3 |
| (b) | Write down some merits of Li-ion batteries. | |
| (c) | What is Shedding in Lead acid batteries? | |
| 4.(a) | Show how a non linear load injects harmonics into line current? | 6+4+8 |
| (b) | Show some applications of dielectric heating. | |
| (c) | Eight resistances each of 100 ohms are used in a resistance oven. If H is the maximum heat obtained from the oven, determine all possible heat output for a supply voltage of 220V, 50 Hz. | |
| 5. | Write short notes on (any two) | 8x2 |
| (a) | Active shaping of line current. | |
| (b) | Choice of frequency for induction heating. | |
| (c) | Basic schemes of UPS | |

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) EXAMINATION, 2019
(4th Year 1st Semester)

SUBJECT : ELECTRICAL UTILISATION & ILLUMINATION ENGINEERING

Full Marks -100

Time : Three hours

(50 marks for each part)

Use a separate Answer-Script for each part

| Part II | | Marks | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|-----------------|---------|---------|---------|---------|---------|---------|---------|------|-------------------|---|-------|-------|-------|-------|-------|-------|---|-----------------|-----|-----|-----|-----|-----|-----|-----|-------|--|
| Answer any three questions. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Two marks reserved for neatness and well organized answer. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.a) | Draw the scotopic and photopic visual response curve of human eye. Explain the relation between radiant power (radiant flux) and light power (luminous flux). | 2+2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b) | Estimate lumen output of a lamp from its SPD data:- | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>(λnm)</th> <th>< 400</th> <th>400-450</th> <th>450-500</th> <th>500-550</th> <th>550-600</th> <th>600-650</th> <th>650-700</th> <th>>700</th> </tr> </thead> <tbody> <tr> <td>\bar{V}_λ</td> <td>0</td> <td>0.008</td> <td>0.110</td> <td>0.780</td> <td>0.910</td> <td>0.320</td> <td>0.020</td> <td>0</td> </tr> <tr> <td>P_λ(W)</td> <td>1.5</td> <td>1.6</td> <td>1.8</td> <td>2.0</td> <td>2.3</td> <td>2.5</td> <td>3.1</td> <td>172.6</td> </tr> </tbody> </table> | (λ nm) | < 400 | 400-450 | 450-500 | 500-550 | 550-600 | 600-650 | 650-700 | >700 | \bar{V}_λ | 0 | 0.008 | 0.110 | 0.780 | 0.910 | 0.320 | 0.020 | 0 | P_λ (W) | 1.5 | 1.6 | 1.8 | 2.0 | 2.3 | 2.5 | 3.1 | 172.6 | |
| (λ nm) | < 400 | 400-450 | 450-500 | 500-550 | 550-600 | 600-650 | 650-700 | >700 | | | | | | | | | | | | | | | | | | | | | |
| \bar{V}_λ | 0 | 0.008 | 0.110 | 0.780 | 0.910 | 0.320 | 0.020 | 0 | | | | | | | | | | | | | | | | | | | | | |
| P_λ (W) | 1.5 | 1.6 | 1.8 | 2.0 | 2.3 | 2.5 | 3.1 | 172.6 | | | | | | | | | | | | | | | | | | | | | |
| c) | Classify indoor and outdoor luminaires based on their photometric characteristics. | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.a) | Consider a room of dimensions 10m*8m*4m. The maintenance factor for the room is 0.8. Coefficient of Utilisation (COU) is 0.5. Find the number of luminaires (each luminaire having a luminous flux of 1000 lumens) required for obtaining an average illuminance of 100 lux on the working plane. Draw a plan view to show the luminaire arrangement. | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b) | Compare Tungsten Halogen lamp, Compact Fluorescent lamp, Low Pressure Sodium Vapour lamp and Light Emitting Diode (LED) lamps on the basis of the following: i) luminous efficacy ii) CCT iii) CRI iv) nominal life in hours v) Application Area | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.a) | Consider two light sources at a height of 10m from the working plane. The distance between the two light sources is 6m. The mean luminous intensities of the two light sources are 1000cd and 2000cd. Find the illuminance at the points just below the two light sources and at a point which is midway from the two light sources on the working plane. | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b) | Explain the terms: luminous flux, luminous intensity, luminance, perfect diffuser and polar plot. | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| c) | State the laws of illumination. | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.a) | What are the functions of ballast in discharge lamps? Compare magnetic ballast with electronic ballast. | 2+2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b) | A luminaire has an intensity distribution of $200(1+\cos\theta)$ and emits no light above. If the lamp emits 1000 lumens, find the Light Output Ratio of the luminaire using zonal lumen method. | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| c) | What are the functions of a luminaire in a lighting system? | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Write Short notes on the following (<u>any 4</u>): | 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| a) | Simple Payback Analysis | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| b) | Luxmeter | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| c) | Distribution Photometer | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| d) | Integrating Sphere | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| e) | Halogen cycle in Tungsten Halogen Lamp | | | | | | | | | | | | | | | | | | | | | | | | | | | | |